DOCUMENT RESUME

ED 448 201 TM 032 231

AUTHOR	Onwuegbuzie, Anthony J.
TITLE	On Becoming a Bi-Researcher: The Importance of Combining Quantitative and Qualitative Research Methodologies.
PUB DATE	2000-11-19
NOTE	34p.; Paper presented at the Annual Meeting of the Association for the Advancement of Educational Research (Ponte Vedra, FL, November 2000).
PUB TYPE	Opinion Papers (120) -- Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Models; *Qualitative Research; Research Design; *Research Methodology; *Researchers

ABSTRACT

The fervent debate over the last 100 years about quantitative and qualitative research paradigms has resulted in a great divide between quantitative and qualitative researchers, who often view themselves as in competition with each other. This polarization has promoted "uni-researchers," researchers who restrict themselves exclusively to either quantitative or qualitative research methods. A false dichotomy exists between quantitative and qualitative research, with all distinctions between the two methods lying on continua. Relying on only one type of data is extremely limiting, and "uni-research" is a threat to the advancement of the social sciences. This paper provides evidence that the debate between quantitative and qualitative methodologies is divisive and counterproductive for advancing the fields of the social and behavioral sciences. All graduate students should learn to use and appreciate both methodologies to develop into "bi-researchers." (Contains 1 figure and 48 references.) (SLD)

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Running head: ON BECOMING A BI-RESEARCHER

On Becoming a Bi-Researcher:

The Importance of Combining Quantitative and Qualitative Research Methodologies

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TM032231

Paper presented at the annual meeting of the Association for the Advancement of Educational Research (AAER), Ponte Vedra, Florida, November, 19, 2000.

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Abstract

The last 100 years has witnessed a fervent debate about quantitative and qualitative research paradigms. Unfortunately, this has led to a great divide between quantitative and qualitative researchers, who often view themselves as in competition with each other. Clearly, this polarization has promoted uni-researchers, namely, researchers who restrict themselves exclusively either to quantitative or to qualitative research methods. Yet, relying on only one type of data (i.e., number or words) is extremely limiting. As such, uni-research is the biggest threat to the advancement of the social sciences. Indeed, as long as we stay polarized in research, how can we expect stakeholders who rely on our research findings to take our work seriously? Thus, the purpose of this paper is to provide evidence that the debate between quantitative and qualitative is divisive and, hence, counterproductive for advancing the social and behavioral science field. Instead, I advocate that *all* graduate students learn to utilize and to appreciate both quantitative and qualitative. In so doing, students will develop into what I term as *bi-researchers*.

On Becoming a Bi-Researcher:

The Importance of Combining Quantitative and Qualitative Research Methodologies

Several years ago, I worked as a researcher for one of the biggest pharmaceutical companies in the world. During my tenure there, a major part of my responsibilities involved analyzing quantitative and qualitative data to determine the efficacy of new drugs and to write reports that were sent to the Food and Drug Administration (FDA) for scrutiny. Quantitative data that were analyzed included those obtained from clinical trials, whereas qualitative data included information on the side effects of the drugs under investigation. Thus, in the pharmaceutical field, mixed methodologies (i.e., qualitative and quantitative techniques) are employed to determine which drugs will receive ratification by the FDA--drugs that are subsequently used by quantitative and qualitative researchers alike!

The methodological pluralism that I observed in the pharmaceutical world appears to occur regularly in the physical sciences (i.e., natural and life sciences), as well as in other scientific fields. However, in the social and behavioral science field, including the field of education, the picture is very different. Indeed, throughout the 20th century, the social and behavioral sciences has witnessed a great divide between two opposing camps of researchers, namely, positivists on one side and interpretivists on the other side. Interestingly, as noted by Sechrest and Sidani (1995), it is only in the social and behavioral sciences that the merits of both research paradigms are so vehemently debated.

The quantitative versus qualitative contest often has been so divisive that many social and behavioral science students who graduate from educational institutions with an aspiration to gain employment in the world of academia or research, are left with the

impression that they have to pledge allegiance to one research school of thought or the other. Even more importantly, these students are led to believe in the *Incompatibility Thesis* (Howe, 1988), which posits that quantitative and qualitative research paradigms and methodologies cannot and must not be mixed. Yet, as noted by Onwuegbuzie (2000a), many individuals who engage in this debate appear to confuse the *logic of justification* with research methodologies. Or, stated another way, there is a general tendency among researchers to treat epistemology and method as being synonymous (Bryman, 1984). This is far from being the case because the logic of justification does not dictate what specific data collection and data analytical methods should be used by researchers. Indeed, differences in epistemology (i.e., logic of justification) do not prevent a qualitative researcher from utilizing procedures more typically associated with quantitative research, and *vice versa* (Onwuegbuzie, 2000a). Thus, the purpose of this paper is to provide evidence that the debate between quantitative and qualitative is divisive and, hence, counterproductive for advancing the social and behavioral science field. Instead, I advocate that *all* graduate students learn to utilize and to appreciate both quantitative and qualitative. In so doing, students will develop into what I term as *bi-researchers*.

Fundamental Differences Between Quantitative and Qualitative Research Paradigm

As stated above, the important difference between quantitative and qualitative researchers prevails at the paradigmatic level. Specifically, the quantitative research paradigm has its roots in positivism. Other terms linked with the quantitative paradigm are *empiricist*, *realist*, *rationalist*, and *foundational*. On the other hand, the qualitative research paradigm stems from interpretivist dogma. Other expressions associated with the

qualitative paradigm are *constructivist*, *naturalistic*, *idealist*, *relativist*, *hermeneutical*, and *antifoundational*. Regardless of the nomenclature used, proponents of both camps (i.e., purists) tend to focus on the *differences* between the quantitative and qualitative philosophies rather than on the *similarities*. According to purists, distinctions exist between quantitative and qualitative researchers with respect to ontology, epistemology, axiology, rhetoric, logic, generalizations, and causal linkages.

With respect to ontological differences, positivists believe that there is a single reality and that this reality, which is expressed in terms of variables, can be measured in a reliable and valid manner using *a priori* operational and standardized definitions, whereas interpretivists believe that there are multiple-constructed realities (i.e., relativist) and that multiple interpretations are available from different researchers that are all equally valid. In the field of the social and behavioral sciences, interpretivists posit that these realities are socially constructed, that they are products of human intellects, and that they alter as their constructors change. Moreover, qualitative purists believe that researchers should study the social world from the view of the actor.

With regard to epistemological differences, positivists contend that the researcher (i.e., knower) and object of study (i.e., known) are independent. As such, according to these proponents, researchers should remain objective in studying phenomena. Conversely, for interpretivists, the researcher and object of study are dependent. As such, qualitative researchers attempt to position themselves as closely as possible to what is being studied.

The role of values (i.e., axiology) are supposed to play a different role in quantitative

and qualitative research. Specifically, positivists contend that inquiry should be value-free, whereas interpretivists believe that research is influenced greatly by the values of investigators. In other words, interpretivists believe that inquiry is value-bound. As such, the rhetoric used by both sets of purists tends to have distinct features. Positivists advocate rhetorical neutrality, involving an exclusively formal writing style using the impersonal voice and specific terminology. On the other hand, interpretivists' writing style predominantly is informal, using the personal voice and limited definitions.

Another difference that quantitative and qualitative researchers emphasize relate to the reasoning process. The hallmark of positivism is the use of deductive reasoning, which is a system for organizing known facts in order to reach a conclusion. In general, deductive reasoning is a cognitive process in which researchers proceed from general to specific conclusions using established rules of logic. Syllogism is a major kind of deductive reasoning. This consists of a major premise, a minor premise, and a conclusion, respectively. For example, if a researcher's major premise is that every research has a chapter on the quantitative-qualitative debate, and that the book under investigation represents a research textbook (i.e., minor premise), then the final link in the deductive reasoning chain would lead the researcher to conclude that the present research textbook must have a chapter discussing the paradigm controversy. Under the deductive reasoning framework, conclusions are true only if the premises on which they are based are true. Thus, positivists emphasize the importance of *a priori* hypotheses and theories.

Interpretivists tend to incorporate inductive reasoning, in which observations are made on particular events, and then, on the basis of these observed events, inferences are

made. In other words, conclusions are reached by observing examples and then making generalizations from the examples. As such, inductive reasoning is the reverse of deductive reasoning. Another way of differentiating the reasoning that drives the two paradigms is via the distinction between logistic reasoning and dialectic reasoning. Logistic reasoning, which involves breaking the whole into parts, is more consistent with positivism; conversely, dialectic reasoning, which involves looking at situations in a holistic way, is more consistent with interpretivism.

Because a major goal in quantitative research is to generalize findings to the population from which the sample was drawn (Onwuegbuzie, 2000b), samples typically are larger than that for qualitative research, wherein use of relatively few cases is more the norm. Further, whereas the preferred sampling method of positivists is that of (probability) random sampling (i.e., simple random sampling, stratified random sampling, cluster random sampling, systematic random sampling, and multi-stage random sampling), interpretivists tend to select purposive (i.e., judgmental), nonprobability samples in which individuals are chosen because of their ability to provide thick, rich data. In qualitative research, generality usually is less of a goal in deciding upon the sample, than who or what can facilitate understanding of the underlying phenomenon (Onwuegbuzie & Daniel, 2000a). In fact, of the 16 types of qualitative sampling techniques identified by Miles and Huberman (1994), only one method is probability based.

Positivists believe that real causes to social scientific outcomes can be determined reliably, and, as such, findings are replicable. These causal agents are assumed to be either temporally precedent to or simultaneous with effects. Positivists contend that the

experimental research design is the only design that can determine cause-effect relationships. Thus, experimental research is the *sine qua non* of quantitative research designs. In experimental research, the researcher manipulates at least one independent variable (i.e., the hypothesized cause), attempts to control potentially extraneous (i.e., confounding) variables, and then measures the effect(s) on one or more dependent variables (Onwuegbuzie, 2000b). According to this line of reasoning, valid cause-effect relationships are established, if results obtained are due *only* to the manipulated independent variable (i.e., possess internal validity). In contrast, however, interpretivists believe that it is impossible to distinguish cause from effects. From their perspective, an experiment, at best, represents a piecemeal attempt to understand the relationships between variables. As such, they believe that experimentation does not identify cause-effect relationships because reality cannot be broken down into component parts without running the risk of distorting the findings--thereby justifying holistic analyses that are generated by qualitative research (Rist, 1977).

As noted by Rossman and Wilson (1985), from the quantitative-qualitative paradigm wars have evolved three major schools of thought, namely: *purists*, *situationalists*, and *pragmatists*. The difference between these three perspectives relates to the extent to which each believes that quantitative and qualitative approaches co-exist and can be combined. These three camps can be conceptualized as lying on a continuum, with purists and pragmatists lying on opposite ends, and situationalists lying somewhere between purists and pragmatists.

Purists posit that quantitative and qualitative methods stem from different ontologic,

epistemologic, axiologic assumptions about the nature of research (Bryman, 1984; Collins, 1984; Tashakkori & Teddlie, 1998). Moreover, for purists, the assumptions associated with both paradigms are incompatible about how the world is viewed and what is important to know. Purists, such as Smith (1983) and Smith and Heshusius (1986), contend that quantitative and qualitative approaches cannot and should not be mixed. As such, they advocate mono-method studies. Simply put, purists treat social science research as a dichotomous enterprise.

Situationalists maintain the mono-method (paradigmatic) stance held by purists, but also contend that both methods have value. However, they believe that certain research questions lend themselves more to quantitative approaches, whereas other research questions are more suitable for qualitative methods. Thus, although representing very different orientations, the two approaches are treated as being "complementary" (Vidich & Shapiro, 1955, p. 33).

Finally, at the other end of the continuum, pragmatists, unlike purists and situationalists, contend that a false dichotomy exists between quantitative and qualitative approaches (Denzin, 1970). These proponents believe that quantitative methods are not necessarily positivist, nor are qualitative techniques necessarily hermeneutic (Cook & Reichardt, 1979; Daft, 1983; Miller & Fredericks, 1991; Sieber, 1973). As such, pragmatists advocate integrating methods within a single study (Creswell, 1995). Moreover, Sieber (1973) articulated that because both approaches have inherent strengths and weaknesses, researchers should utilize the strengths of both techniques in order to understand better social phenomena. Indeed, pragmatists ascribe to the philosophy that the research

question should drive the method(s) used, believing that "epistemological purity doesn't get research done" (Miles & Huberman, 1984, p. 21). In any case, researchers who ascribe to epistemological purity disregard the fact that research methodologies are merely tools that are designed to aid our understanding of the world.

The differences between the three major research paradigms is outlined in Figure 1. This figure represents a bi-dimensional diagram portraying two sets of poles, namely, (a) a vertical pole with the quantitative research paradigm and the qualitative research paradigm at the opposite ends of the pole, and (b) a horizontal pole with quantitative methods and qualitative methods at the opposite ends of the pole. That is, the vertical pole is at the level of logic of justification (Smith & Heshusius, 1986), reconstructed logic (Kaplan, 1964), or epistemology (Bryman, 1984), whereas the horizontal pole is at the methodological level (Smith & Heshusius, 1986), logic in use (Kaplan, 1964), or technical level (Bryman, 1984).

In Figure 1, the upper left quadrant, labeled as "(1)," represents quantitative purists, who believe that research should be undertaken via the exclusive use of the quantitative framework, that is, adhering to the positivist assumptions and utilizing only quantitative research methodologies. In stark contrast, the bottom right quadrant, labeled as "(4)," represents qualitative purists, who ascribe exclusively to hermeneutical principals using only qualitative techniques. The upper right quadrant, labeled as "(2)," represents a direct challenge to positivism because it involves the use of qualitative methods to test hypotheses and the like. Finally, the lower left quadrant, marked as "(3)," represents an direct challenge to interpretivist dogma because it entails the use of quantitative methods

to discover meaning of social phenomena. Situationalists advocate the separate use of quadrants "(1)" and "(4)," but do not believe that the combinations represented by quadrants "(2)" and "(3)" are possible. On the other hand, pragmatists believe that regardless of the research paradigm, quantitative and qualitative methodologies should be mixed, if the research question lends itself to this format. As such, pragmatists champion the simultaneous use of quadrants "(1)" and "(2)," as well as the combined use of quadrants "(2)" and "(4)."

Insert Figure 1 about here

Misconceptions Held by Purists and Situationalists

Many of the differences that are perceived to prevail between quantitative and qualitative research stem from the misconceptions and mis-claims of proponents of both camps. On the positivist side of the fence, the barriers that they have built arises from their narrow definition of the concept of "science." As noted by Onwuegbuzie (2000d), positivists claim that the essence of science is objective verification, and that their methods are objective. However, positivists disregard the fact that many research decisions are made throughout the research process that precede objective verification decisions made. For example, in developing instruments that yield empirical data, psychometricians select items in an attempt to represent the content domain adequately (Onwuegbuzie & Daniel, 2000b). Yet, choosing these items represents a subjective decision at every stage of the instrument-development process. Thus, although the final version of the instrument can

lead to objective scoring, because of the subjectivity built into its development, any interpretations of the scores yielded cannot be 100% objective. Simply put,

SUBJECTIVITY + OBJECTIVITY = SUBJECTIVITY

Moreover, although In the physical sciences, many properties of objects can be measured with near-perfect reliability, in the social sciences, the vast majority of measures yield scores that are, to some degree, unreliable. This is because constructs of interest in the social science fields typically represent abstractions (e.g., personality, achievement, intelligence, motivation, locus of control) that must be measured indirectly (Onwuegbuzie & Daniel, 2000b). Failure to attain 100% score reliability implies measurement error, which, in turn, introduces subjectivity into any interpretations. However, no more compelling and timely example of the pervasiveness of measurement error likely exists than the initial results of the 2000 United States Presidential Election in the state of Florida, which, at the time of writing this essay, has led to recounts, legal action, confusion, frustration, and other negative emotions that I have refrained from documenting in the final version of this paper.

Onwuegbuzie (2000d) provided other examples of subjectivity that prevail in quantitative research, including the obsessive use of the 5% level of significance to test null hypotheses, the lack of random sampling prevalent in educational research that limits generalizability, and the fact that variables can explain as little as 2% of the variance of the dependent variable to be considered statistically significant. Thus, total objective verification is not possible in quantitative research. As such, in the social science field, at least, the techniques used by positivists are no more inherently scientific than are the procedures utilized by interpretivists.

Interpretivists also are not safe from criticism. In particular, their claim that multiple, contradictory, but valid accounts of the same phenomenon always exist is extremely misleading, inasmuch as it leads many qualitative researchers to adopt an "anything goes" relativist attitude, thereby not paying due attention to providing an adequate rationale for interpretations of their data (Onwuegbuzie, 2000c). That is, many qualitative methods of analyses "often remain private and unavailable for public inspection" (Constas, 1992, p. 254). Yet, without standards, when do we know whether what we know is trustworthy?

Similarities Between Quantitative and Qualitative Research Approaches

Indubitably the most disturbing feature of the paradigm wars is the relentless focus on the differences between the two orientations. For some researchers and theorists, this focus has taken the form of an obsession. As noted by Onwuegbuzie (2000a, p. 4), "much of the quantitative-qualitative debate has involved the practice of polemics, which has tended to obfuscate rather than to clarify, and to divide rather than to unite educational researchers." Indeed, the two dominant research paradigms have resulted in two research subcultures, "one professing the superiority of 'deep, rich observational data' and the other the virtues of 'hard, generalizable' survey data" (Sieber, 1973, p. 1335).

Yet, there are overwhelmingly more similarities between quantitative and qualitative perspectives than there are differences. First and foremost, both quantitative and qualitative procedures involve the use of observations to address research questions. As noted by Sechrest and Sidani (1995, p. 78), both methodologies "describe their data, construct explanatory arguments from their data, and speculate about why the outcomes they observed happened as they did."

Not emphasized by purists is the fact that both sets of researchers use techniques that are relatively analogous at some level of specificity. Specifically, like quantitative researchers, most researchers incorporate safeguards into their research in order to minimize confirmation bias and other sources of invalidity that have the potential to prevail in every research study (Onwuegbuzie, 2000b, 2000c; Sandelowski, 1986). For example, both quantitative and qualitative researchers often attempt to triangulate their data. Further, like interpretivists, to some degree, quantitative data analysts attempt to provide explanations as to their findings (McLoughlin, 1991; Polkinghorne, 1988), as well as to make interpretive, narrative conclusions pertaining to the implications of their findings (Dzurec & Abraham, 1993).

As noted by Dzurec and Abraham (1993), meaning is not a function of the type of data collected (i.e., quantitative vs. qualitative). Rather, meaning results from the interpretation of data, whether represented by numbers or words. Whereas quantitative researchers utilize statistical techniques and subjective inferences to make decisions about what their data mean in the context of an *a priori* theoretical or conceptual framework, qualitative researchers use phenomenological procedures and their views of reality to discover meaning (Dzurec & Abraham, 1993).

Both sets of researchers select and use analytical techniques that are designed to obtain the maximal meaning from their data, and manipulate their data so that findings have utility with respect to their respective views of reality (Dzurec & Abraham, 1993). Moreover, both types of inquirers attempt to explain complex relationships that exist in the social science field. To this end, quantitative researchers utilize multivariate techniques

(Elmore & Woehlke, 1998), whereas qualitative researchers incorporate the collection of rich, thick data into their design via prolonged engagement, persistent observation, and other strategies (Lincoln & Guba, 1985).

Additionally, both quantitative and qualitative investigators utilize techniques to verify their data. The former incorporate a myriad of control procedures and random sampling techniques to maximize internal and external validity, respectively (Onwuegbuzie, 2000b), with the latter using an array of methods for assessing the truth value, verisimilitude, auditability, credibility, authenticity, or legitimacy of qualitative research. Such techniques include triangulation, prolonged engagement, persistent observation, leaving an audit trail, member checking, weighting the evidence, checking for representativeness of sources of data, checking for researcher effects, making contrasts/comparisons, checking the meaning of outliers, using extreme cases, ruling out spurious relations, replicating a finding, assessing rival explanations, looking for negative evidence, obtaining feedback from informants, peer debriefing, clarifying researcher bias, and thick description (Creswell, 1998; Onwuegbuzie, 2000c).

Interestingly, data reduction typically is an important part of the data analysis process for both quantitative and qualitative researchers. Whereas statisticians utilize data-reduction methods such as factor analysis and cluster analysis, interpretivists conduct thematic analyses (Onwuegbuzie, 2000a). Thus, factors that emerge from multivariate analyses are analogous to emergent themes from thematic analyses. Indeed, Onwuegbuzie (2000a) demonstrated how themes emerging from qualitative data analyses can be factor analyzed to obtain what he termed meta-themes that subsume the original

themes, thereby describing the relationship among these themes. Additionally, the popularization of complex multivariate analyses (e.g., structural equation modeling and hierarchical linear modeling), coupled with the increased emphasis on generalizability theory, allow quantitative researchers to pay better attention to context effects than previously has been the case.

As noted by Newman and Benz (1998), rather than representing bi-polar opposites, quantitative and qualitative research represent an interactive continuum. Moreover, the role of theory is central for both paradigms. Specifically, in qualitative research, the most common purposes are that of theory initiation and theory building, whereas in quantitative research, the most typical objectives are that of theory testing and theory modification (Newman & Benz, 1998). Clearly, neither tradition is independent of the other, nor can either school encompass the whole research process. Thus, both quantitative and qualitative research are needed to gain a more complete understanding of phenomena (Newman & Benz, 1998).

Another way in which quantitative and qualitative research are congruent lies in the fact that both empirical and qualitative data are interchangeable. That is, just as it could be contended that all data are basically qualitative (Berg, 1989) inasmuch as they represent an attempt to capture a raw experience, so it could be argued that all data can be quantified (Sechrest & Sidana, 1995). More specifically, all data can be binarized, a term coined by Onwuegbuzie (2000a) to describe dichotomously expressing a variable in binary form (i.e., "1" vs. "0"). Indeed, just as experimental, quasi-experimental, and correlation research designs can incorporate the collection of observational and interview

data, so can qualitative designs include the collection of empirical data. As aptly stated by Kaplan (1964, p. 207), "Quantities are of qualities, and a measured quality has just the magnitude expressed in its measure." Consistent with this statement, Onwuegbuzie (2000a) provided a rationale for reporting and interpreting effect sizes in qualitative research. Onwuegbuzie noted that when conducting typological analyses, qualitative analysts only identify emergent themes; however, these themes can be quantitized to ascertain the hierarchical structure of emergent themes. Subsequently, he presented a typology of effect sizes in qualitative research. Additionally, Onwuegbuzie illustrated how inferential statistics can be utilized in qualitative data analyses. According to this author, "this can be accomplished by treating words arising from individuals, or observations emerging from a particular setting, as sample units of data that represent the total number of words/observations existing from that sample member/context" (p. 2). Onwuegbuzie argued that inferential statistics can be used to provide more complex levels of *verstehen* than is presently undertaken in qualitative research. Building on Onwuegbuzie's work, Onwuegbuzie and Teddlie (in press) outlined different ways of conducting mixed methodological analyses.

However, quantification should not be viewed as an end to itself, but instead as a means of utilizing existing techniques that provide incremental validity to thematic analyses (Weinstein & Tamur, 1978). Further, it should be stressed that mixed method analyses always are possible or even appropriate. Indeed, the challenge is knowing when it is useful to count and when it is difficult or inappropriate to count (Gherardi & Turner, 1987).

As discussed above, many parallels exist between quantitative and qualitative

research. Regardless of orientation, all research in the social sciences represents an attempt to understand human beings and the world around them. Thus, it is clear that although, presently, certain methodologies tend to be associated with and utilized by one particular research tradition or the other, as stated by Dzurec and Abraham (1993, p. 75), "the objectives, scope, and nature of inquiry are consistent across methods and across paradigms." Indeed, the purity of a research paradigm is a function of the extent to which the researcher is prepared to conform to its underlying assumptions. If differences exist between quantitative and qualitative researchers, these discrepancies do not stem from different goals but because these two groups of researchers have operationalized their strategies differently for reaching these goals (Dzurec & Abraham, 1993). This suggests that methodological pluralism should be promoted. The best way for this to occur is for as many investigators as possible to become bi-researchers.

Barriers Affecting the Bi-Researcher Movement.

The lack of epistemological ecumenism that prevails in the behavioral and social science field in general and in the field of educational research in particular stems from several factors. In particular, the century-long trend of doctoral students graduating with basic competency in only one research orientation (i.e., uni-researchers) has arisen from graduate-level instruction in which quantitative and qualitative research methodologies are taught as two isolated disciplines, rather than as parts of a holistic, reflective, integrative process; from graduate-level curricula that minimize students' exposure to quantitative and qualitative content; from a lack of training in mixed methodological techniques; from proliferations of various erroneous "mythologies" about the nature of quantitative and

qualitative research; from increasing numbers of research methodology instructors teaching out of their specialty areas; and from a failure, unwillingness, or even refusal to recognize that the epistemological purity that was popular in previous decades no longer reflect best practices and, moreover, may now be deemed inappropriate, invalid, or obsolete.

Students who are least similar in learning style to their quantitative research methodology instructor tend to understand the quantitative research process to a lesser extent than do their counterparts (Onwuegbuzie & Daley, 1998). Thus, it is likely that this mismatch in learning modalities between some students and their quantitative research methodology instructor has a detrimental effect on students' levels of motivation and confidence to learn quantitative research techniques. Anxiety is another reason why very few bi-researchers prevail at present. Indeed, many students with a dominant qualitative orientation have been found to have the highest levels of statistics anxiety (Onwuegbuzie, 2000e). The latter finding, coupled with qualitative anecdotal evidence over the last few years, leads me to believe that many qualitative researchers reject quantitative methodologies not out of epistemological purity, but because of statistics anxiety and anxiety about quantitative research. These debilitative levels of anxiety result from a lack of understanding of statistical concepts and an inadequate mathematics background (Onwuegbuzie, DaRos, & Ryan, 1997). Similarly, anecdotal evidence suggests that many quantitative researchers, as a result of their statistical training, are not comfortable about getting close to their study participants. Thus, for many quantitative investigators, rejection of qualitative methodologies likely stems from their insecurities. Their disdain for qualitative

research also may arise from their lack of patience for undertaking thematic analyses, exacerbated by the automated manner of statistical analyses via computer software that has spoilt them. In fact, many quantitative researchers do not even have the patience to check their statistical assumptions (e.g., examining histograms) (Onwuegbuzie & Daniel, 2000a, in press).

Many uni-researchers feel alienated by researchers with different orientations. This feeling of alienation is exacerbated by the terminology used by writers from both disciplines. The language used in quantitative research is particularly problematic for students. In fact, Onwuegbuzie et al. (1997) found that for many graduate students, statistics anxiety stems from the conventions of notation and terminology. These learners find the language and structure to be unusual. Also, some students report an uneasiness at being asked to accept certain assumptions, formulas, and concepts, as is common in statistical analyses (Onwuegbuzie et al., 1997).

Finally, as noted above, the dearth of bi-researchers also appears to stem from researchers' faulty perceptions of a one-to-one relationship between epistemology and method. Interestingly, Snizek (1976), who analyzed many published research articles, concluded that the research techniques utilized cannot be directly extrapolated from a knowledge of the investigator's epistemological underpinnings and assumptions. More recently, Gueulette, Newgent, and Newman (1999), who analyzed 339 randomly selected studies that were labeled by their authors as representing qualitative research, found that 44.1% of these articles actually involved the blending of qualitative and quantitative methodologies. This latter finding illustrates the blurred line between quantitative and

qualitative research.

Towards Methodological Pluralism

In order to become bi-researchers, the barriers mentioned above must be dismantled or at least minimized. One step towards accomplishing this is to re-frame the concept of research in the social and behavioral sciences by de-emphasizing the terms quantitative and qualitative research and, instead, sub-dividing research into *exploratory* and *confirmatory* methods (Onwuegbuzie & Teddlie, in press). According to Onwuegbuzie and Teddlie (in press), such a re-conceptualization unites quantitative and qualitative data collection and data analytical procedures under the same framework. Onwuegbuzie and Teddlie (in press) conceptualized a model in which quantitative data analysis techniques are labeled as exploratory (e.g., descriptive statistics, exploratory factor analysis, and cluster analysis), and exploratory qualitative data analysis involves the traditional thematic analyses. With regard to confirmatory methods, quantitative data-analytical techniques incorporate the assortment of inferential statistics, whereas qualitative data-analytic methods involve *confirmatory thematic analyses*, in which replication qualitative studies are conducted to assess the replicability of previous emergent themes (i.e., research driven) or to test an extant theory (i.e., theory driven), when appropriate (Onwuegbuzie & Teddlie, in press).

Using Onwuegbuzie and Teddlie's (in press) framework, quantitative and qualitative research courses can be re-designed as courses in exploratory and confirmatory techniques that teach quantitative and qualitative methodologies within each course, either simultaneously or in a sequential manner. Qualitative and quantitative research faculty

team-teaching a course would be truly creative and exciting. Moreover, such courses would send a strong message to students that applied quantitative and qualitative research, for the most part, have the same goal, namely to understand phenomena systematically and coherently. As such, students enrolled in these courses will come to regard research as being a collaborative undertaking. Additionally, these courses would allow students to focus on the similarities of quantitative and qualitative research outlined above, rather than on the differences. However, most importantly, such courses will help to develop bi-researchers equipped to utilize both quantitative and qualitative techniques.

Advantages of Being a Bi-Researcher

Becoming a bi-researcher offers a myriad of advantages for individuals. First and foremost, it enables researchers to be flexible in their investigative techniques, as they attempt to address a range of research questions that arise. Bi-researchers also are more likely to promote collaboration among researchers, regardless of philosophical orientation. Based on Newman and Benz's (1998) conceptualization of the role of theory in quantitative and qualitative inquiries, bi-researchers are more likely to view research as a holistic endeavor that requires prolonged engagement, persistent observation, and triangulation (Lincoln & Guba, 1985).

By having a positive attitude towards both techniques, bi-researchers are in a better position to use qualitative research to inform the quantitative portion of research studies, and vice versa. For example, the inclusion of quantitative data can help compensate for the fact that qualitative data typically cannot be generalized. Similarly, the inclusion of qualitative data can help explain relationships discovered by quantitative data.

Bi-researchers also are more able to combine empirical precision with descriptive precision (Onwuegbuzie, 2000a). Also, armed with a bi-focal lens (i.e., both quantitative and qualitative data), rather than with a single lens, bi-researchers are able to *zoom in* to microscopic detail or to *zoom out* to indefinite scope (Willems & Raush, 1969). As such, bi-researchers have the opportunity to combine the macro and micro levels of a research issue.

As noted by Madey (1982), combining quantitative and qualitative research helps to develop a conceptual framework, to validate quantitative findings by referring to information extracted from the qualitative phase of the study, and to construct indices from qualitative data that can be used to analyze quantitative data. Further, because quantitative research typically is motivated by the researcher's concerns, whereas qualitative research often is driven by a desire to capture the participant's voice, bi-researchers are able to merge these two emphases within a single investigation.

Because bi-researchers utilize mixed methodologies within the same inquiry, they are able to delve further into a dataset to understand its meaning and to use one method to verify findings from the other method. Indeed, building on Rossman and Wilson's (1985) work, Greene, Caracelli, and Graham (1989) outlined the following five broad purposes of mixed-methodological studies: (a) Triangulation (i.e., seeking convergence and corroboration of results from different methods studying the same phenomenon); (b) Complementarity (i.e., seeking elaboration, enhancement, illustration, clarification of the results from one method with results from the other method); (c) Development (i.e., using the results from one method to help inform the other method); (d) Initiation (i.e., discovering

paradoxes and contradictions that lead to a re-framing of the research question); and (e) Expansion (i.e., seeking to expand the breadth and range of inquiry by using different methods for different inquiry components). Greene et al.'s framework, as well as those outlined in Tashakkori and Teddlie's (in press) book, entitled, *Handbook of mixed methods in social and behavioral research*, offer potential for developing bi-researchers.

Conclusions

The last 100 years has witnessed a fervent debate about quantitative and qualitative research paradigms. Unfortunately, this has led to a great divide between quantitative and qualitative researchers, who often view themselves as in competition with each other. Clearly, this polarization has promoted uni-researchers, namely, researchers who restrict themselves exclusively either to quantitative or to qualitative research methods. Yet, relying on only one type of data (i.e., number or words) is extremely limiting. As such, uni-research is the biggest threat to the advancement of the social sciences. Indeed, as long as we stay polarized in research, how can we expect stakeholders who rely on our research findings to take our work seriously?

It has been shown throughout this paper that a false dichotomy exists between quantitative and qualitative research. In fact, as noted by Tashakkori and Teddlie (1998), all distinctions between quantitative and qualitative research methods lie on continua. For example, the extent to which an independent variable is manipulated lies on a continuum ranging from situations in which the investigator is the agent of change in the "treatment" to cases where the investigator has no control over such changes. Similarly, the research setting used lies on a continuum ranging from natural to controlled. Indeed, experiments

can occur in natural settings (e.g., field experiments), while case studies can occur in controlled settings (e.g., clinical case studies). Additionally, hypotheses lie on a continuum ranging from exploratory to confirmatory. These are just a few examples that illustrate the false dichotomy prevailing between both traditions. Indeed, if a construct is measured using only one research method, then it would be difficult to differentiate the construct from its particular mono-method operational definition (Tashakkori & Teddlie, 1998).

As noted by Sechrest and Sidani (1995), a growth in the bi-researcher movement has the potential to reduce some of the problems associated with singular methods. By utilizing quantitative and qualitative techniques within the same framework, bi-researchers can incorporate the strengths of both methodologies. Most importantly, bi-researchers are more likely to be cognizant of all available research techniques and to select methods with respect to their value for addressing the underlying research questions, rather than with regard to some preconceived biases about which paradigm is a hegemony in social science research.

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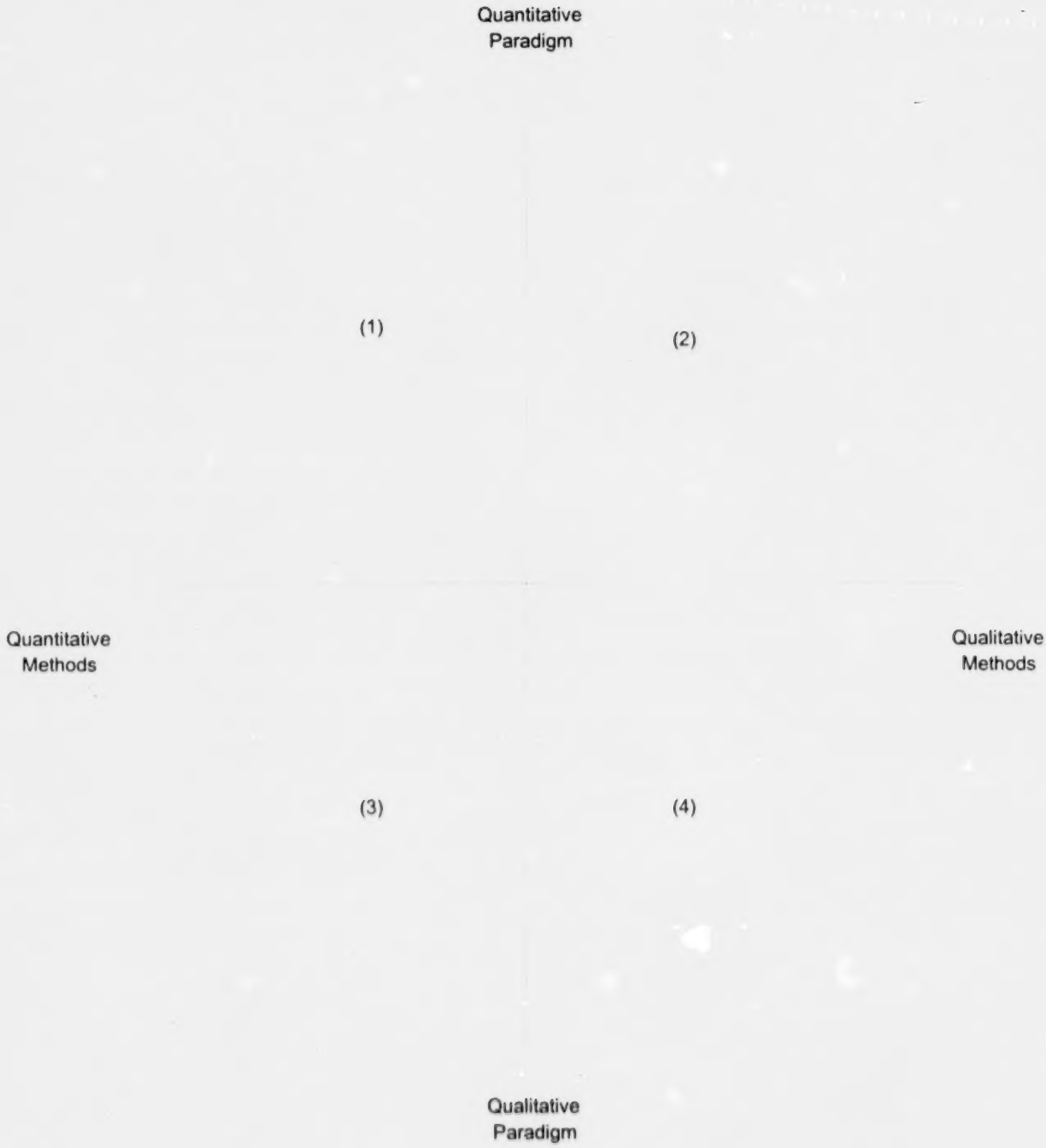
Figure Caption

Figure 1. Bi-dimensional representation of purist, situationalist, and pragmatist philosophies.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